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**ENGLISH  
TRANSLATION OF  
AMENDMENT UNDER  
PCT ARTICLE 34**

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English translation of Amendment under PCT Article 34  
& Proposed Preliminary amendment

PCT/JP2004/007775

Please note that we have filed a response to the Written Opinion of the International Searching Authority and the Demand along with an amendment under the PCT Article 34(2)(b). In the amendment under the PCT Article 34, claim 1 was amended and claim 4 was cancelled. Attached please find an English translation of the amendment under the PCT Article 34(2)(b). In addition, please amend claims as attached in order to make the claim dependency appropriate. We trust that these are self explanatory, but do not hesitate to contact us if you have any questions.

**WHAT IS CLAIMED IS (Preliminary amendment) :**

1 (amended). A method of producing a silicon carbide single crystal comprising:

5        storing a sublimation law material on a first end portion in a reaction container;

            disposing a seed crystal of a silicon carbide single crystal on a second end portion substantially facing the sublimation law material in the reaction container; and

10        re-crystallizing the sublimated sublimation law material on the seed crystal to grow a silicon carbide single crystal, wherein a sealing portion is provided for covering the single crystal growth possible region in the reaction container to grow a silicon carbide single crystal on the seed crystal

15        provided in the sealing portion while preventing the leak of the sublimated sublimation law material from the atmosphere for sublimation.

2. The method of producing a silicon carbide single crystal  
20 according to claim 1, wherein the thermal expansion coefficient of the sealing portion is substantially the same as that of the seed crystal.

3. The method of producing a silicon carbide single crystal  
25 according to claim 2, wherein the material of the sealing portion is a graphite.

4 (cancel) .

5. The method of producing a silicon carbide single crystal according to claim 1, comprising

5 growing the silicon carbide single crystal while maintaining the whole growing surface in a convex shape throughout all growth processes.

6. The method of producing a silicon carbide single crystal  
10 according to claim 1, comprising

growing the silicon carbide single crystal while the entire surface excluding the growth surface contacts the sealing portion throughout all growth processes.

15 7. The method of producing a silicon carbide single crystal according to claim 5,

wherein a crystal of silicon carbide containing a silicon carbide single crystal is grown approximately in a protruded shape.

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8. The method of producing a silicon carbide single crystal according to claim 5, comprising

growing the crystal of silicon carbide containing a silicon carbide single crystal while maintaining the approximate protruded shape and,

wherein the diameter of the crystal of silicon carbide decreases gradually toward the sublimation raw material

throughout all the growth processes.

9. The method of producing a silicon carbide single crystal according to claim 1, comprising

5 growing the silicon carbide single crystal only in regions of the second end portion excluding parts adjacent to the peripheral wall surface portion of the reaction container.

10. The method of producing a silicon carbide single crystal  
10 according to claim 6,

wherein the crystal of silicon carbide containing a silicon carbide single crystal is composed only of a silicon carbide single crystal.

15 11. The method of producing a silicon carbide single crystal according to claim 5, comprising:

storing a sublimation law material on the first end portion side in the reaction container;

disposing a seed crystal for a silicon carbide single crystal  
20 on the second end portion side in the reaction container;

forming the sublimation atmosphere so as to enable sublimation of the sublimation law material by a first heating means disposed on the first end portion side; and

25 forming the re-crystallization atmosphere such that the sublimation law material sublimated by the first heating means is re-crystallized only in the vicinity of the seed crystal of the silicon carbide single crystal by a second heating means

disposed on the second end portion side so as to re-crystallize the sublimation law material on the seed crystal of the silicon carbide single crystal.

- 5 12. The method of producing a silicon carbide single crystal according to claim 11,

wherein the temperature of the re-crystallization atmosphere is lower than the temperature of the sublimation atmosphere by 30 to 300°C, in the reaction container.

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13. The method of producing a silicon carbide single crystal according to claim 11,

wherein the first heating means and the second heating means are an induction-heatable coil.

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14. The method of producing a silicon carbide single crystal according to claim 13,

wherein the current value of the induction heating current in the first heating means is larger than the current value 20 of the induction heating current in the second heating means.

15. The method of producing a silicon carbide single crystal according to claim 13,

wherein the current value of the induction heating current 25 in the second heating means is decreased continuously or gradually with the increase of the diameter of a growing silicon carbide single crystal.

16. The method of producing a silicon carbide single crystal according to claim 11,

wherein if the temperature at one end side accommodating  
5 a sublimation raw material is represented by  $T_1$  and the temperature at another end side at which a seed crystal of a silicon carbide single crystal is placed is represented by  $T_2$ , in the reaction container, and the temperature of the part adjacent to the inner peripheral side surface part of the  
10 reaction container at said another end side is represented by  $T_3$ , then,  $T_3-T_2$  and  $T_1-T_2$  increase continuously or gradually.

17. The method of producing a silicon carbide single crystal according to claim 13,

15 wherein an interference preventing means capable of flowing the induction current and preventing interference between the first heating means and the second heating means by flowing the induction current is placed between the first heating means and the second heating means.

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18. The method of producing a silicon carbide single crystal according to claim 17, wherein the interference preventing means is a coil through which cooling water can flow.

25 19. The method of producing a silicon carbide single crystal according to claim 11, wherein the one end is a lower end and another end is an upper end.

20. The method of producing a silicon carbide single crystal according to claim 11, wherein the reaction container is a crucible placed in a quartz tube.

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21. The method of producing a silicon carbide single crystal according to claim 11, wherein an inner side region adjacent to the region for carrying out the silicon carbide single crystal growth in the second end portion and an outer side region on 10 the outer circumference of the inner side region are provided as independent members such that one end of the member forming the inner side region is contacted with a sealing portion provided in the reaction container and the other end is exposed to the outside of the reaction container.

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22. The method of producing a silicon carbide single crystal according to claim 1, wherein the surface of the part adjacent to the peripheral side surface part in the reaction container at another end is made of glassy carbon.

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23. The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source at least one compound selected 25 from high purity alkoxy silanes and alkoxy silane polymers, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

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24. The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source a high purity alkoxy silane, as  
10 a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a  
15 non-oxidizing atmosphere.

25. The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

20 using as a silicon source at least one of a high purity alkoxy silane and a polymer of a high purity alkoxy silane, as a carbon source a high purity organic compound generating carbon by heating;

uniformly mixing the silicon source and the carbon source  
25 to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

26. The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

5       using as a silicon source at least one compound selected from the group consisting of high purity methoxysilane, high purity ethoxysilane, high purity propoxysilane and high purity butoxysilane, as a carbon source a high purity organic compound generating carbon by heating;

10      uniformly mixing the silicon source and the carbon source to obtain a mixture; and

          calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

15     27. The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

          using as a silicon source at least one compound selected from the group consisting of high purity methoxysilane, high purity ethoxysilane, high purity propoxysilane and high purity butoxysilane, and a polymer of them having a polymerization degree of 2 to 15, as a carbon source a high purity organic compound generating carbon by heating;

20      uniformly mixing the silicon source and the carbon source to obtain a mixture, and calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

28.The method of producing a silicon carbide single crystal according to claim 5, wherein the sublimation raw material is a silicon carbide powder obtained by

using as a silicon source at least one of compound selected  
5 from the group consisting of high purity monoalkoxysilanes, high purity dialkoxysilanes, high purity trialkoxysilanes and high purity tetraalkoxysilanes, and a polymer of them having a polymerization degree of 2 to 15, as a carbon source a high purity organic compound generating carbon by heating;

10 uniformly mixing the silicon source and the carbon source to obtain a mixture; and

calcinating the resulted mixture by heating under a non-oxidizing atmosphere.

15 29.The method of producing a silicon carbide single crystal according to claim 23, wherein the silicon source is a tetraalkoxysilane polymer and the carbon source is a phenol resin.

20 30.The method of producing a silicon carbide single crystal according to claim 23, wherein each content of impurity elements in the silicon carbide powder is 0.5 ppm or less.

25 31.A silicon carbide single crystal produced by the method of producing a silicon carbide single crystal according to claim 5.

32. The silicon carbide single crystal according to claim 31, wherein the crystal defect in the form of hollow pipe of which image is optically detected is  $100/\text{cm}^2$  or less.

5    33. The silicon carbide single crystal according to claim 31, wherein the total content of impurity elements is 10 ppm or less.

10    34. A silicon carbide single crystal production apparatus, comprising at least a crucible having a reaction container main body capable of storing a sublimation law material; a lid portion provided detachably to the reaction container main body; and a sealing portion having substantially the same thermal expansion coefficient as that of the seed crystal, capable of 15 placing a silicon carbide single crystal, for preventing the leak of the sublimated sublimation law material.

20    35. The silicon carbide single crystal production apparatus according to claim 34, wherein the sealing portion comprises a bottom portion having a first surface to substantially face to the sublimation law material for allowing the installation of the seed crystal at the time of being provided on the reaction container main body and a second surface facing the lid portion, and a wall portion provided upright from the rim portion 25 circumference of the first surface of the bottom portion so as to form the hollow portion together with the first surface of the bottom portion, such that the single crystal growth

possible region of the circumferential side portion of the reaction container is covered at the time the first surface of the bottom portion is provided in the reaction container substantially facing the sublimation law material.

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36. The silicon carbide single crystal production apparatus according to claim 35, wherein the material of the sealing portion is a graphite.

10 37. The silicon carbide single crystal production apparatus according to claim 34, further comprising:

a first induction heating coil disposed in a spirally wound state on the outer circumference of the portion for storing the sublimation law material in the crucible for forming the  
15 atmosphere for sublimation for allowing sublimation of the sublimation law material; and

a second induction heating coil disposed in a spirally wound state on the outer circumference of the portion for storing the seed crystal in the crucible for forming the

20 re-crystallization atmosphere for re-crystallization for allowing the re-crystallization of the sublimation law material sublimated by the first induction heating coil only in the vicinity of the seed crystal of the silicon carbide single crystal to re-crystallize the sublimation law material on the  
25 seed crystal of the silicon carbide single crystal.

38. The silicon carbide single crystal production apparatus

according to claim 37, wherein an interference preventing means is disposed between the first heating means and the second heating means, capable of supplying an induction electric current and preventing the interference between the first  
5 induction heating means and the second induction heating means by supplying the induction electric current.

39. The silicon carbide single crystal production apparatus according to claim 38, wherein the interference preventing coil  
10 is a coil allowing passage of the cooling water.